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IS 1970 (1995): Crop Protection Equipment - Hand- Operated
Compression Knapsack Sprayer [FAD 21: Farm Implements and
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भारतीय मानक

फसल संरक्षण उपस्कर — हस्तचालित पीठ पर लादा जाने
वाला संपीडन फुहारा — विशिष्ट

(पाँचवाँ पुनरीक्षण)

Indian Standard

CROP PROTECTION EQUIPMENT —
HAND-OPERATED COMPRESSION KNAPSACK
SPRAYER — SPECIFICATION

(*Fifth Revision*)

ICS 65.060.40

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BUREAU OF INDIAN STANDARDS
MANAK BHAVAN, 9 BAHADUR SHAH ZAFAR MARG
NEW DELHI 110002

FOREWORD

This Indian Standard (Fifth Revision) was adopted by the Bureau of Indian Standards after the draft finalized by the Crop Protection Equipment Sectional Committee had been approved by the Food and Agriculture Division Council.

This standard was first published in 1961 and subsequently revised in 1965, 1971, 1974 and 1982. In view of the improvements suggested by the users of this standard, a need was felt to revise it again. This revision incorporates, among others, the following:

- a) Amendment No. 1 issued to earlier version of the standard;
- b) Editorial changes including updating of referred standards;
- c) Materials of construction are modified and chemical composition of brass casting components as per relevant Indian Standard is to ensure conformity;
- d) Provision of supplying cut-off-device other than Annex C of IS : 3652 as per purchaser's requirement;
- e) Test for tank fatigue;
- f) Order of testing;
- g) Test for piston made of synthetic rubber.

The figures given in the standard are meant only for illustration of the components. These should not be considered as suggestions of any standard design.

This standard was earlier published in two parts. With the withdrawal of IS 1970 (Part 2) : 1979 'Pressure retaining type hand operated compression knapsack sprayer', this revision has been published as single standard without any part.

For the guidance of purchaser, Annex A has been compiled. Besides, quoting the number of this standard, the details desired in the Annex may also be stated.

For the purpose of deciding whether a particular requirement of this standard is complied with, the final value, observed or calculated, expressing the result of a test or analysis, shall be rounded off in accordance with IS 2 : 1960 'Rules for rounding off numerical values (*revised*)'. The number of significant places retained in the rounded off value should be the same as that of the specified value in this standard.

Indian Standard

CROP PROTECTION EQUIPMENT — HAND-OPERATED COMPRESSION KNAPSACK SPRAYER — SPECIFICATION

(Fifth Revision)

1 SCOPE

1.1 This standard specifies material, performance, constructional and other requirements of hand-operated compression knapsack sprayer, non-pressure retaining type used for spraying pesticides.

1.1.1 The sprayers of this type are normally used with an average working pressure of 400 kPa. (100 kPa = 1.019 7 kgf/cm² = 1 bar).

2 REFERENCES

The following Indian Standards are necessary adjuncts to this standard:

IS No.	Title
292 : 1983	Leaded brass ingots and casting (<i>second revision</i>)
2643 (Part 1) : 1975	Dimensions for pipe threads for fastening purposes : Part 1 Basic profile and dimensions (<i>first revision</i>)
3624 : 1987	Pressure and vacuume gauges (<i>second revision</i>)
3652 : 1995	Crop protection equipment—Foot sprayer—Specification (<i>fourth revision</i>)
3906 : 1995	Hand-operated knapsack sprayer (<i>fourth revision</i>)
7201 (Part 1) : 1987	Methods of sampling for agricultural machinery and equipment: Part 1 Hand tools and hand operated animal-drawn equipment (<i>first revision</i>)
8480 : 1977	Glossary of terms related to crop protection equipments
10134 : 1994	Methods of tests for manually operated sprayers

3.1 Clean-out Port

A component for draining and cleaning the tank.

3.2 Compression Sprayer

A sprayer, the tank of which is a pressure vessel and the air pressure is created either by inbuilt pump or from outside.

3.3 Drain plug

A plug provided in the clean-out port.

3.4 Filler Bung

A device for closing the opening of the filler ring.

3.5 Filler Ring

A ring provided on the tank with a hole in centre for filling the liquid.

3.6 Gasket — (see 3.4 of IS 3906 : 1995).

3.7 Guide

A component for guiding the movement of the piston rod.

3.8 Handle

A component to actuate the piston rod.

3.9 Hose Connection

Device for connecting the delivery hose with the discharge outlet and the cut-off device.

3.10 Knapsack Sprayer

A sprayer which can be mounted on the back of an operator for spraying.

3.11 Mass — (see 3.10 of IS 3906 : 1995).

3.12 Non-pressure Retaining Type Sprayer

A sprayer in which the tank acts as a pressure vessel and the working pressure does not remain constant during spraying.

3.13 Piston — (see 3.12 of IS 3906 : 1995).

3 TERMINOLOGY

3.0 For the purpose of this standard, the following definitions in addition to IS 8480 : 1977 shall apply (see also Fig. 1, 2, 3 and 4).

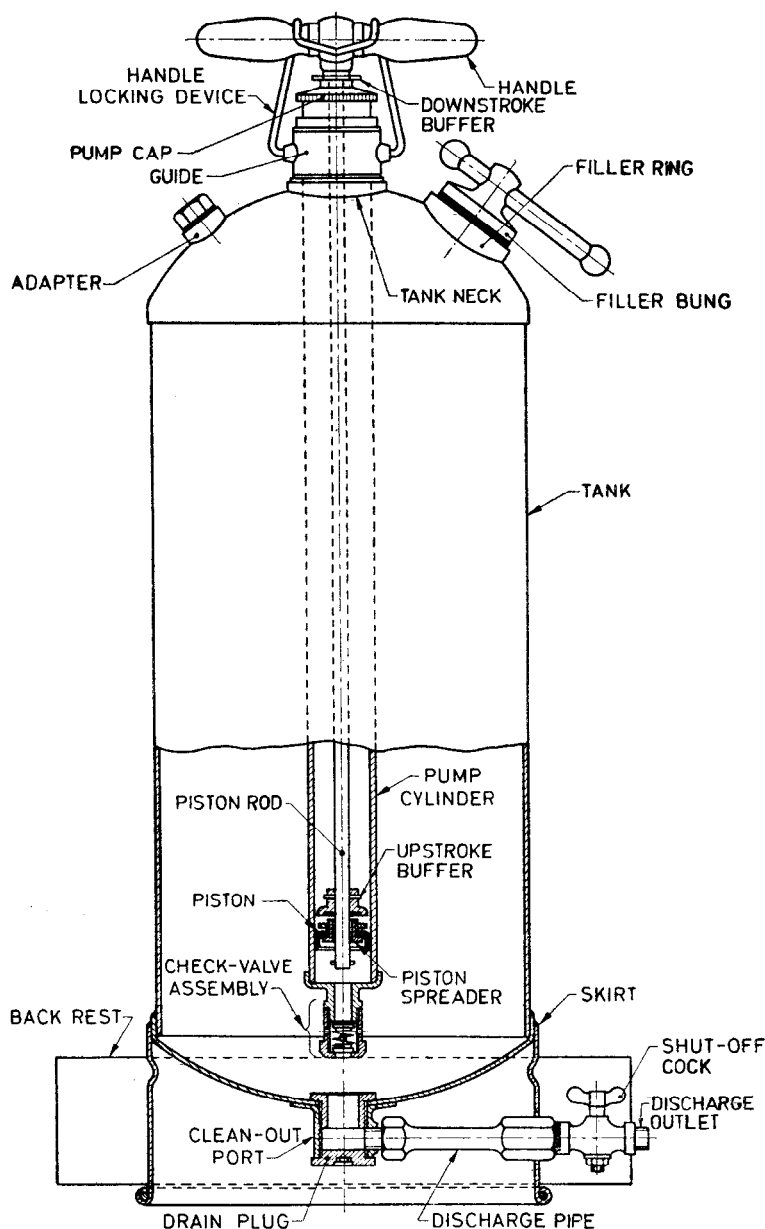


FIG. 1 HAND-OPERATED COMPRESSION KNAPSACK SPRAYER NON-PRESSURE RETAINING TYPE WITH T-HANDLE

3.14 Piston Rod — (see 3.14 of IS 3906 : 1995). **3.18 Stroke**

3.15 Pump Cylinder — (see 3.17 of IS 3906 : 1995).

3.16 Skirt

A support to prevent the bottom of the tank from damage.

3.17 Spreader — (see 3.19 of IS 3906 : 1995).

The maximum travel of the piston rod in one direction when the handle moves from its lowest possible position to highest possible position.

3.19 Tank

A container to hold liquid and to act as a pressure vessel.

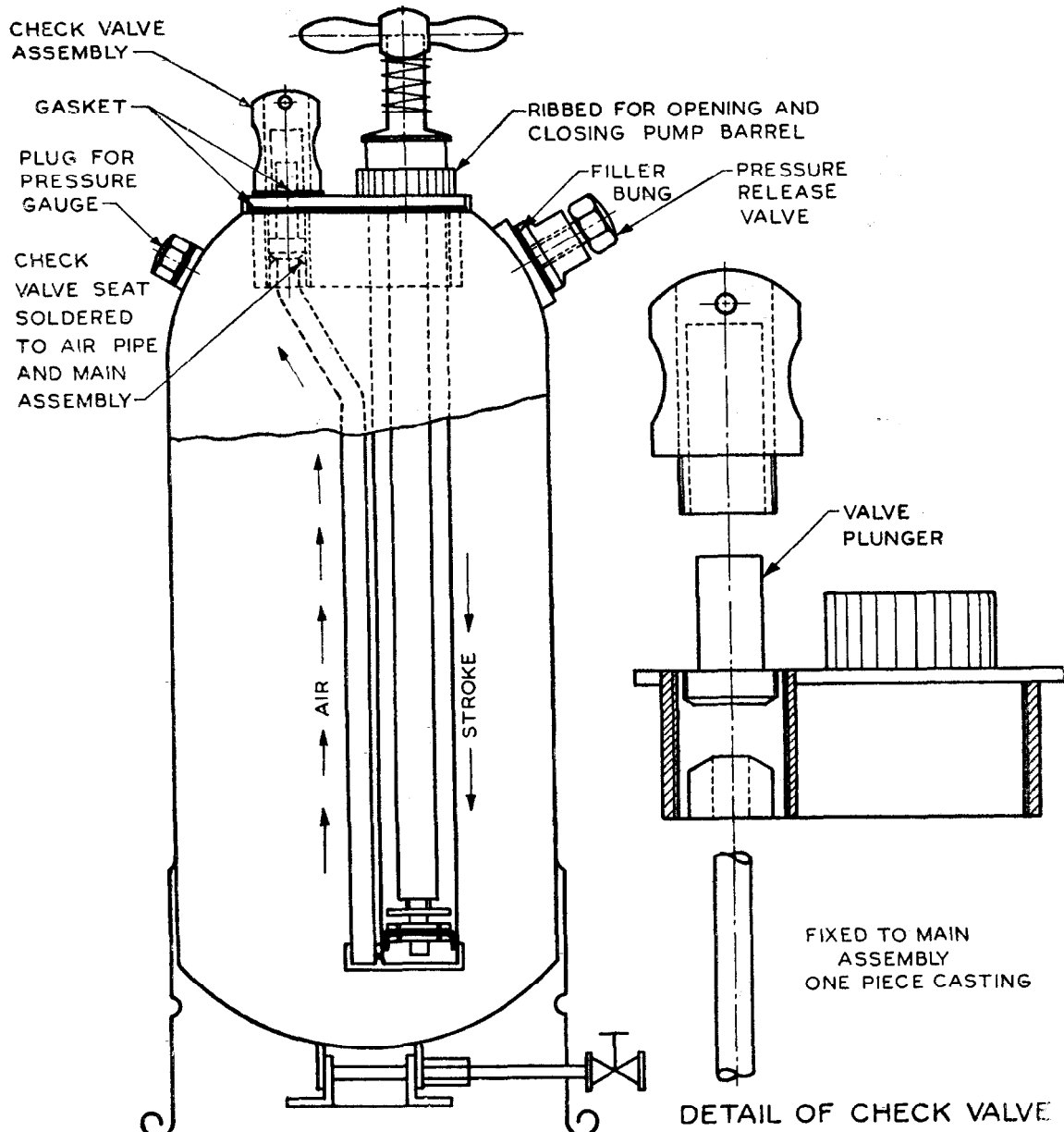


FIG. 2 HAND-OPERATED COMPRESSION KNAPSACK SPRAYER NON-PRESSURE
RETAINING TYPE WITH VALVE ASSEMBLY AT TOP

3.20 Tank Capacity — (see 3.22 of IS 3906 : 1995).

3.21 Valve Assembly — (see 3.23 of IS 3906 : 1995).

4 MATERIALS

4.1 The material of construction of various components of the sprayer shall be selected from col 3 of Table 1. The material other than brass casting may conform to the relevant Indian Standard, however brass casting components shall conform to the chemical composi-

tion of any of the grade specified in IS 292 : 1983 (Grade to be declared by the manufacturer). Some of the relevant Indian Standards are given in Annex B of IS 3652 : 1995 for guidance.

4.2 The material for spray lance, nozzle, cut-off device and its components shall be as given in Table 1 of IS 3652 : 1995.

4.3 All metallic parts coming in contact with the pesticides should preferably be of the same material to minimize bimetallic corrosion.

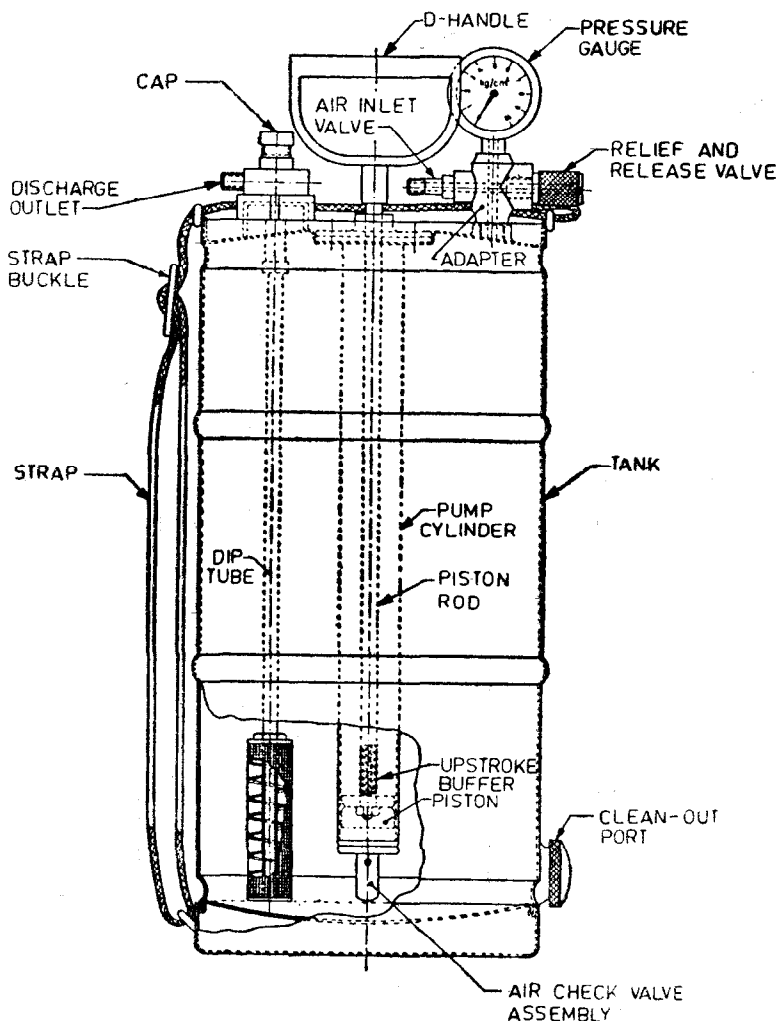


FIG. 3 HAND-OPERATED COMPRESSION KNAPSACK SPRAYER
NON-PRESSURE RETAINING TYPE WITH D-HANDLE

4.4 The material used for various parts shall be declared by the manufacturer in the manual (see 7.1).

5 PERFORMANCE

5.1 When tested in accordance with the method given in 6.3 of IS 10134 : 1994, the pump shall be able to develop a pressure of minimum 400 kPa in the tank.

6 CONSTRUCTIONAL REQUIREMENTS

6.1 Tank and Skirt

The tank capacity (see 3.20) shall be as agreed to between the purchaser and the manufacturer. The tank capacity shall be with a tolerance of ± 0.5 litre on the declared value.

6.1.1 The tank shall be provided with a skirt which shall project a minimum of 12 mm beyond the lowest portion of the bottom of the tank.

6.1.2 The tank fitted with skirt shall withstand the test prescribed in 7.1, 7.10 and 7.11 of IS 10134 : 1994.

6.2 Straps

Two straps of not less than 800 mm when adjusted to maximum possible length and 38 mm in width shall be provided in order to help carriage of the sprayer. In case of the sprayer having capacity up to 9 litres, only one strap may be provided. Provision for adjustment of the length of each strap shall also be provided.

6.2.1 The straps and their assembly shall withstand the test prescribed in 7.3 of IS 10134 : 1994.

6.2.2 In case of sprayers having two straps, a back rest shall be provided.

6.3 Filler Ring

A filler ring having a hole of minimum 30 mm in diameter shall be provided.

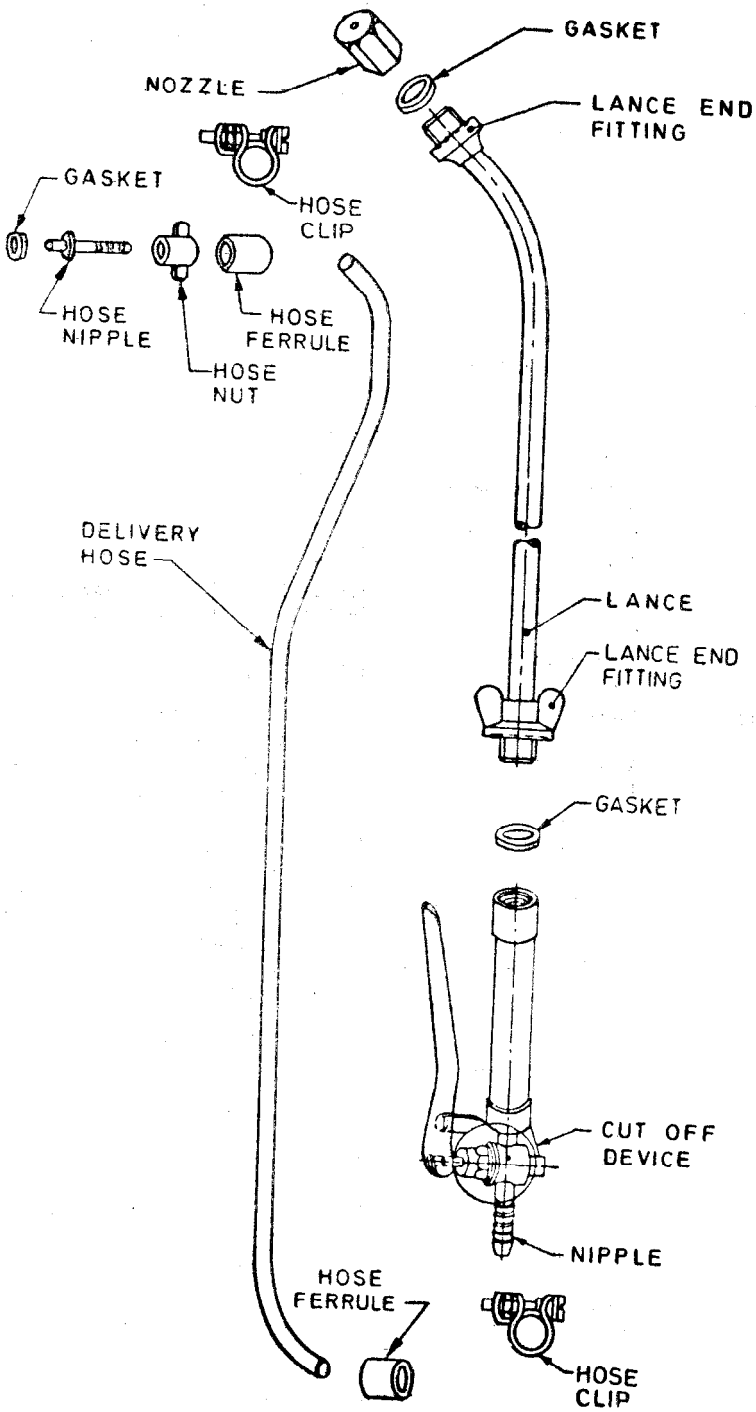


FIG. 4 DISCHARGE LINE OF SPRAYER

Table 1 Materials of Construction of Various Components

(Clause 4.1)

Sl No.	Component	Materials
(1)	(2)	(3)
i)	Tank	Brass
ii)	Filler ring	do
iii)	Filler bung	do
iv)	Pump cylinder	do
v)	Guide	do
vi)	Clean-out port	do
vii)	Drain plug	Brass Engineering Plastic
viii)	Discharge pipe	Brass
ix)	Pump cap	do
x)	Hose nut	do
xi)	Hose nipple	Engineering plastic Brass Aluminium alloy
xii)	Strainer	Brass Stainless steel Plastic
xiii)	Piston rod	Steel
xiv)	Hose ferrule/clip	G. P. Steel Steel
xv)	Handle locking device	Steel
xvi)	Handle	Wood Plastic
xvii)	Piston	Chrome tanned leather Synthetic rubber PVC
xviii)	Spreader	Spring steel Brass
xix)	Buffer	Spring steel
xx)	Strap	Woven web cotton/ Synthetic yarn
xxi)	Hose	Braided rubber PVC
xxii)	Gasket	Synthetic rubber PVC Fibre
xxiii)	Valve seat	Brass
xxiv)	Valve	Brass Synthetic rubber PVC
xxv)	Shut-off cock	Brass Engineering plastic
xxvi)	Skirt	Steel
xxvii)	Back rest	Steel Engineering plastic
xxviii)	Strap buckle	Steel G. P. Steel
xxix)	Cushion	Foam rubber Foam plastic Rubberized Coir Foam
xxx)	Foot rest	Steel

NOTES

1 All the components mentioned above may not be present in a particular design.

2 The components other than those listed in the table and coming in direct contact with the pesticides shall be of corrosion resistance material.

6.3.1 Filler Bung

The hole shall be covered with a spill-proof filler bung. The bung may be threaded with a pressure releasing hole on the side.

6.3.2 Strainer

A removable strainer on the filling hole or a separate filling funnel with strainer shall be provided to filter the liquid while filling in the tank. The average size of any side or diameter of the apertures of the strainer shall be not more than 625 μ m.

NOTE — For measuring the size of apertures, select 10 consecutive apertures in the strainer and measure each side or diameter as the case may be. Average the measured values and report.

6.4 Pump Cylinder

The inner diameter of the pump cylinder shall be not more than 40 mm.

6.4.1 It shall withstand the test prescribed in 7.1 of IS 10134 : 1994.

6.5 Piston

The height of the piston shall be 13 mm minimum. In case the piston is made out of synthetic rubber, it shall withstand the test prescribed in 7.1 of IS 10134 : 1994.

6.5.1 Spreader

If provided it shall be able to hold the piston in its shape and position without distortion against the wall of the pump cylinder.

6.6 Piston Rod

The piston rod shall be not less than 9.0 mm in diameter.

6.6.1 Buffer

A buffer device shall be provided on the piston rod in order to prevent the direct impact of the handle on the pump body.

6.6.2 Guide

A guide at the top of the pump cylinder with the provision of fixing handle locking device shall be provided.

6.7 Handle

The handle shall be of a 'D' or 'T' shape. If of the 'D' shape, it shall have an inside grip not less than 130 mm long with an inside vertical clearance of not less than 35 mm. The grip shall be attached with handle support. If of 'T' shape the length of the either side from the centre of piston rod shall be not less than 100 mm. The diameter of the handle grip in both the types shall be not less than 25 mm.

6.7.1 Handle Locking Device

The sprayer shall be fitted with a convenient quick action locking device for locking the handle. If wire is used, it shall be not less than 3 mm in diameter. The device shall be able to hold the handle properly when the handle is brought to its lowest possible position.

6.8 Valve Assembly

The valve assembly shall withstand the test prescribed in 7.9 of IS 10134 : 1994.

6.9 Discharge Pipe

A discharge pipe shall be provided to take out the liquid from the tank.

NOTE — In some designs, a dip tube is provided in place of discharge pipe. If fitted, it shall be emerged from top of the tank and shall be easily detachable from the tank.

6.10 Threaded Connections

All threaded connections on sprayer and its components shall conform to the requirements given in 6.5 of IS 3652 : 1995.

6.11 Discharge Outlet

The discharge outlet shall be nipple type or threaded type. The length of the nipple shall be not less than 20 mm.

6.12 Gaskets

The gaskets of synthetic rubber, wherever provided, shall withstand the test prescribed in 7.4 of IS 10134 : 1994.

6.13 Delivery Hose

A delivery hose of suitable diameter and at least one metre in length shall be provided as agreed to between the purchaser and the supplier. The hose shall be connected with the discharge outlet and the cut-off device through hose connection.

6.13.1 Hose Connection

The hose connection for threaded type and nipple type connection shall be nut-nipple and clamp type and clamp type respectively. The clamp shall be in the form of ferrule or clip.

6.13.2 The hose and hose connection shall withstand the test prescribed in 7.2 of IS 10134 : 1994.

6.14 Cut-off Device and Lance

The cut-off device and lance shall conform to the requirements given in Annex C and Annex D of IS 3652 : 1995.

NOTE — In case the cut off device and spray lance of a type other than that specified in Annex C and D of IS 3652 : 1995 is required by the purchaser, for the special purpose, its requirements shall be as agreed to between the purchaser and the supplier.

6.15 Nozzles

The nozzle shall be either hollow cone type or fan type and shall conform to the requirements as given in Annex F of IS 3652 : 1995.

6.16 Adopter and Cap

An adopter shall be provided in the sprayer for fixing the pressure gauge, even if the pressure gauge is not required by the purchaser. The adopter shall have internal thread size G1/8 [see IS 2643 (Part 1) : 1975] and shall be covered with a leakproof cap.

NOTE — The cap shall be provided even if the pressure gauge is required by the purchaser.

6.17 Height

The height from the base of the skirt of the tank to the centre of the handle grip, when the handle is moved to its highest and lowest possible positions, shall be not more than 1.1 m and not less than 0.6 m respectively.

NOTE — In the sprayers having tank capacity less than 12 litres, the requirements given in 6.17 may not apply.

6.18 Mass

The mass (see 3.11) of the sprayer shall be not more than 8.0 kg.

6.19 Endurance

The sprayer shall withstand the test prescribed in 8.2 of IS 10134 : 1994.

7 OTHER REQUIREMENTS

7.1 Manual

The manual shall conform to the requirements given in 7.1 in IS 3652 : 1995.

7.2 Spare Parts

Spare parts shall meet the requirements given in 7.2 of IS 3652 : 1995.

7.3 Optional Items

At the option of the purchaser, the following items, with the requirements indicated against each, shall be provided in the sprayer. Any other optional items required by the purchaser shall be supplied, the requirements for the same shall be as agreed to between the purchaser and the supplier.

7.3.1 Strap Cushion

A cushion of minimum 40 mm width and 20 mm thickness may be provided with each strap at least on the portion that rests on the shoulder of the operator. The cushion, if provided, shall be covered with suitable covering material, such as canvas, rexine and PVC or plastic-coated fabrics.

7.3.2 Back Rest Cushion

The back rest cushion may be provided. The cushion, if provided, shall be covered with suitable covering material, such as canvas, rexine and PVC or plastic-coated fabrics.

7.3.3 Shut-Off Cock

It shall be provided in the discharge pipe. The cock shall be capable of allowing free flow of liquid, when open, without stoppage and leakage.

7.3.4 Pressure Gauge

A pressure gauge of 50 mm nominal size (see IS 3624 : 1987) shall be provided. It should be graduated between 0 and not exceeding 2.5 times but not less than one and a half times of the normal working pressure of the sprayer. The gauge shall have external thread size of G1/8B [see IS 2643 (Part 1) : 1975] for connection. The dial and cover should preferably be of shatter-proof plastic.

7.3.5 Pressure-Relief Valve

A pressure relief valve, which shall not allow the increase of pressure in the tank by more than 1.5 times of the normal working pressure, shall be provided. The normal working pressures developed in the tank shall not drop if discharge outlet closed. The valve shall be fitted on the tank by external thread of size G1/8B designation.

7.3.6 Foot Rest

A folding foot rest attached at the lower side of the skirt of tank shall be provided.

7.3.7 Lance Brackets

Two brackets or clamps, one at the bottom and other at the top side of the tank shall be provided to keep lance and nozzle folded when the sprayer is not in use.

7.3.8 Air-Inlet Valve

For the purpose of supplying air pressure to the tank from an outside source, an air inlet valve may be provided.

7.3.9 Clean-Out Port

A clean-out port may be provided. If provided, it shall be fitted with a drain plug. The opening in the port shall be not less than 18 mm in diameter.

8 WORKMANSHIP AND FINISH

8.1 The components of the sprayer shall have a smooth finish and shall be free from burrs, sharp edges and other visual defects that may be detrimental for their use.

8.2 Exposed steel parts shall have a protective coating to prevent surface deterioration. The steel used for hose ferrule/clip, piston rod and buffer shall be plated with cadmium, zinc or nickel-chrome. Exposed brass parts may be given a suitable protective finish with clear transparent lacquer.

9 MARKING AND PACKING

9.1 Marking

Each sprayer shall be marked with the following particulars:

- Manufacturer's name or recognized trade-mark;
- Batch or serial number; and
- Tank nominal capacity.

9.2 BIS Certification Marking

The product may also be marked with the Standard Mark.

9.2.1 The use of the Standard Mark is governed by the provisions of *Bureau of Indian Standards Act*, 1986 and the Rules and Regulations made thereunder. The details of conditions under which the licence for the use of Standard Mark may be granted to manufacturers or producers may be obtained from the Bureau of Indian Standards.

9.3 Packing

Each sprayer shall be packed, as agreed to between the purchaser and the supplier, for safe handling in transit.

10 SAMPLING FOR LOT ACCEPTANCE

10.1 Unless otherwise agreed to between the purchaser and the supplier, sampling of the sprayers for lot acceptance shall be done in accordance with 3 of IS 7201 (Part 1) : 1987.

11 METHODS OF TESTS

11.1 The requirements of this specification shall be tested in accordance with the relevant clauses of IS 10134 : 1994.

11.2 Test for various requirements given in the order below shall be followed by the testing authorities:

- Dimensional and visual check — [see 6.1.1, 6.2, 6.2.2, 6.3, 6.3.2, 6.6.2, 6.7, 6.7.1, 6.9, 6.10, 6.13, 6.13.1, 6.14, 6.15, 6.16, 6.17, 7 (except 7.3.3 and 7.3.5) and 9.1];
- Mass — (see 6.18);
- Tank capacity — (see 6.1);
- Test for filler bung — (see 6.3.1);

- e) Test for pressure development — (*see* **5.1**);
- f) Test for shut-off cock — (*see* **7.3.3**) (optional);
- g) Test for pressure relief valve — (*see* **7.3.5**) (optional);
- h) Endurance test — (*see* **6.19**);
- j) Valve assembly test — (*see* **6.8**);
- k) Strap drop test — (*see* **6.2.1**);
- m) Dimensional and visual check — (*see* **6.4, 6.5, 6.6, 6.6.1 and 8**);
- n) Pump cylinder test — (*see* **6.4**);
- p) Tank leakage test — (*see* **6.1.2**);
- q) Hose and hose connection test — (*see* **6.13.2**);
- r) Test for nozzles — (*see* **6.15**);
- s) Test for spray lance — (*see* **6.14**);
- t) Test for cut-off device — (*see* **6.14**);
- u) Test for tank fatigue — (*see* **6.1.2**);
- v) Test for tank impact — (*see* **6.1.2**);
- w) Test for gaskets and piston — (*see* **6.12 and 6.5**);

NOTES

1 Test for hose and hose connection, cut-off device and lance may be conducted at one time.

2 The gasket and piston test shall be conducted with a new set of gaskets and piston provided with the sprayer.

ANNEX A

(*Foreword*)

SPECIFICATION SHEET

1. Name of the purchaser.
2. Preference of material for various components (*see* **4.1**).
3. Tank capacity (*see* **6.1**).
4. Type of handle (*see* **6.7**).
5. Type of cut-off device (*see* **6.14**).
6. Type of lance (*see* **6.14**).
7. Type of nozzle (*see* **6.15**).
8. Length of delivery hose (*see* **6.13**).
9. Spare parts needed (*see* **7.2**).
10. Optional items (*see* **7.3**).

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Review of Indian Standards

Amendments are issued to standards as the need arises on the basis of comments. Standards are also reviewed periodically; a standard along with amendments is reaffirmed when such review indicates that no changes are needed; if the review indicates that changes are needed, it is taken up for revision. Users of Indian Standards should ascertain that they are in possession of the latest amendments or edition.

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Amendments Issued Since Publication

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BUREAU OF INDIAN STANDARDS

Headquarters:

Manak Bhavan, 9 Bahadur Shah Zafar Marg, New Delhi 110002
Telephones : 331 01 31, 331 13 75

Telegrams : Manaksanstha
(Common to all offices)

Regional Offices :

Telephone

Central : Manak Bhavan, 9 Bahadur Shah Zafar Marg
NEW DELHI 110002

{ 331 01 31
{ 331 13 75

Eastern : 1/14 C. I. T. Scheme VII M, V. I. P. Road, Maniktola
CALCUTTA 700054

{ 37 84 99, 37 85 61
{ 37 86 26, 37 86 62

Northern : SCO 335-336, Sector 34-A, CHANDIGARH 160022

{ 60 38 43
{ 60 20 25

Southern : C. I. T. Campus, IV Cross Road, MADRAS 600113

{ 235 02 16, 235 04 42
{ 235 15 19, 235 23 15

Western : Manakalaya, E9 MIDC, Marol, Andheri (East)
BOMBAY 400093

{ 832 92 95, 832 78 58
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**AMENDMENT NO. 1 MAY 2002
TO
IS 1970 : 1995 CROP PROTECTION EQUIPMENT —
HAND-OPERATED COMPRESSION KNAPSACK
SPRAYER — SPECIFICATION**

(Fifth Revision)

(Page 4, clause 4.4) — Insert the following new clause after 4.4:

‘4.5 The engineering plastics used for manufacturing various components as given in Table 1 shall be co-polymer plastics or reinforced high density polyethylene or reinforced polypropylene.’

(Page 8, clause 7.3.9) — Insert the following new clause after 7.3.9:

‘7.4 Mask, Hand Gloves and Safety Goggles

Each sprayer shall be provided with a set of mask, hand gloves and safety goggles.’

(FAD 59)